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The Rocky Mountain INFORMS Chapter is pleased to host Tristan Becker, who is the Junior Professor of Management Science in the Faculty of Business and Economics at TU Dresden. He received his doctorate from Ruhr University Bochum. Prior to joining TU Dresden, he served as a postdoctoral researcher at RWTH Aachen University. His primary research focuses on the development of mathematical models and solution algorithms for combinatorial optimization problems, with applications in areas such as sustainable supply chains, modular production, emergency medical services, and workforce scheduling.

Title: Solving the Rotating Workforce Scheduling Problem and Selected Extensions

Abstract: Rotating workforce scheduling is a central planning task in many industries requiring continuous coverage, such as manufacturing, public transport, and emergency services. In a rotating schedule, all employees follow the same cyclic pattern of work shifts and days off, shifted in time, which ensures fair schedules and long-term predictability. This talk presents a general algorithmic framework for solving the Rotating Workforce Scheduling Problem. It is based on a graph representation that models a rotating schedule as an Eulerian cycle of work and rest sequences, yielding problem formulations that are compact in the number of employees. This representation solves all benchmark instances of the rotating workforce scheduling problem to optimality within seconds, reducing computational times by orders of magnitude compared to the previous state of the art. Furthermore, we present results for two extensions of the problem that become computationally tractable using the compact solution approach. First, we integrate shift design into the rotating workforce scheduling problem, minimizing shift design cost and schedule ergonomics penalties in a bi-objective model. An analysis of the Pareto-efficient frontiers shows that substantial ergonomic improvements are often attainable for a minor deterioration in shift design cost. Second, we address uncertain staffing requirements through a two-stage stochastic program in which a stable rotating pattern is complemented by flexibility instruments such as additional hiring, overstaffing, on-call duties, and call-ins. An extensive computational study quantifies the economic value of anticipating uncertainty in the design of rotating schedules.